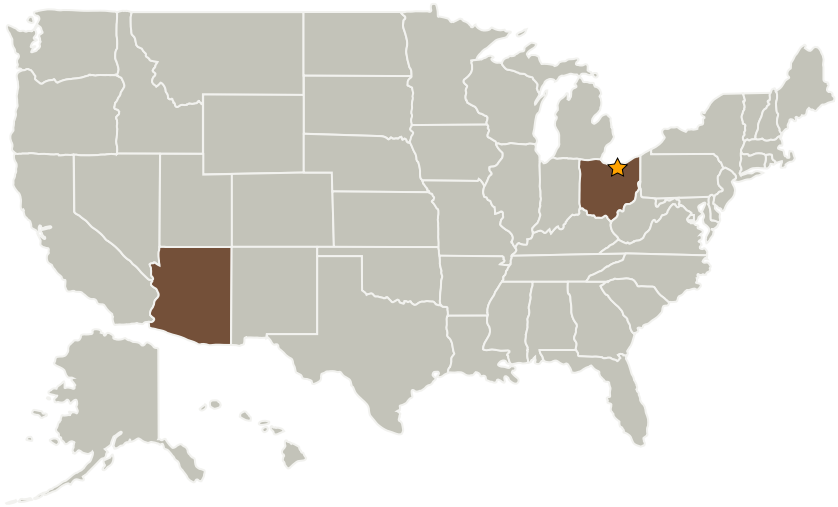
FILM-ID: Package for Identification of Multi-Dimensional Film Coefficient Maps, Phase I

Completed Technology Project (2004 - 2004)

Project Introduction

ZONA proposes to investigate a novel family of algorithms designed to solve the boundary condition identification problem (BCIP) to extract accurate multi-dimensional heat transfer coefficient maps that are required for the design of advanced/revolutionary turbomachinery components. ZONA will develop, implement, and verify FILM-ID a general-purpose package based on a Boundary Element Method (BEM) inverse algorithm for accurate retrieval of multi-dimensional film coefficient distributions (h) using either transient or steady temperature inputs. This method can be used with broad-band or narrow-band thermochromic crystal or laser induced fluorescence thermal imaging techniques and incorporates a new technique which provides robustness to input temperature uncertainties. The proposed method is flexible and easy to implement for examination of arbitrarily complex geometries encountered in turbomachinery as it requires only surface mesh. Phase I will focus on: (1) establishing the importance of the multi-dimensional modeling of the inverse boundary identification problem, (2) developing analytical methods for narrow-band thermochromic liquid crystal, and (3) fine-tuning the regularization process. Phase II will focus on code development, extensive verification, extension to 3-D modeling, and development of user-friendly interfaces and help manuals. It is anticipated that the proposed method will replace the conventional 1-D method for heat transfer coefficient retrieval.

Primary U.S. Work Locations and Key Partners



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Organizational Responsibility

Responsible Mission Directorate:

Space Technology Mission Directorate (STMD)

Lead Center / Facility:

Glenn Research Center (GRC)

Responsible Program:

Small Business Innovation Research/Small Business Tech Transfer

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Organizations Performing Work	Role	Type	Location
★Glenn Research Center(GRC)	Lead Organization	NASA Center	Cleveland, Ohio
ZONA Technology, Inc.	Supporting Organization	Industry Small Disadvantaged Business (SDB)	Scottsdale, Arizona

Primary U.S. Work Locations	
Arizona	Ohio

Project Management

Program Director:

Jason L Kessler

Program Manager:

Carlos Torrez

Principal Investigator:

Xiaowei Gao

Technology Areas

Primary:

- TX09 Entry, Descent, and Landing
  - TX09.4 Vehicle Systems
    - TX09.4.5 Modeling and Simulation for EDL